The Report Committee for John Phillip Beam
Certifies that this is the approved version of the following report:

Tiny House, Big Rewards?

APPROVED BY

SUPERVISING COMMITTEE:

Supervisor:

Jill Marshall

Anthony Petrosino

Tiny House, Big Rewards?

by

John Phillip Beam, B.S.

Report

Presented to the Faculty of the Graduate School of

The University of Texas at Austin

in Partial Fulfillment

of the Requirements

for the Degree of

Master of Arts

The University of Texas at Austin

August 2015

Dedication

This is dedicated to my family who gave me the space when I needed it, the quiet when I got grumpy and the swift kick in the butt when I needed it for deadlines. I am sad I missed vacationing the last three summers without y'all but the future summers are wide open for adventures.

Abstract

Tiny House, Big Rewards?

John Phillip Beam, M.A.

The University of Texas at Austin, 2015

Supervisor: Jill Marshall

Traditional architectural engineering classes teach students the basics of architecture which may lead to the creation of a model made out of balsa wood and wood glue which then gets taken home to collect dust or immediately deposited in the closest trashcan. To make the experience more authentic and meaningful, I have created two units to augment the Project Lead The Way class, Green Architecture (https://www.pltw.org/our-programs/pltw-gateway/pltw-gateway-curriculum). The first unit includes the designing and building of a tiny house that will be donated to a local charity that works with the homeless. The students have their hands on every step in the process from idea generation to construction to the presentation of the house to the charity. In this unit the students are also introduced to sustainability education, learning to live off the grid and exploring the use of repurposed materials to reduce

their carbon footprint. The second unit will be used to support the first unit as it has the students explore and understand homelessness. This unit has the students define homelessness and research its causes. The unit does not just have the students research homelessness, it also gives them a homeless experience; “surviving” one night outdoors with only the resources of a homeless person. This unit concludes with the students carrying out a service project based on the interest of the group, their collective talents and the needs of the community. Both service learning and sustainability education have been slowly pushed aside due to a climate of high stakes testing. There is a general feeling the administration at our school and at the district level feels at the time in class is better served by teaching content only. By adding these two units, my hope is to give the administrators as well as the students in the class a better understanding of the need for both sustainability and service in our world as well as in our community.

Table of Contents

List of Figures

Chapter 1 - Introduction

Growing up, I wanted to become an architect. I took all the classes offered through my senior year in high school. The same thing held true for each of the classes; we would go through the process of designing something, get a grade and that was it. There was never an end product. The closest thing to a "real" house was a balsa wood frame with no sheathing that we got to take home to our parents. It collected dust and was eventually thrown away. There was nothing to call my own nor was there anything demonstrating the hard work that had gone into the process. In the end, it is probably not the sole reason I did not pursue a degree in engineering but it was a contributing factor. I feel that having students build something that is real and tangible will help give them motivation to continue architecture or engineering into college. This project is meant to be a capstone for the Project Lead The Way (PLTW) class, Green Architecture (https://www.pltw.org/our-programs/pltw-gateway/pltw-gateway-curriculum). Green Architecture is a curriculum offered by Project Lead The Way, a provider of K-12 Science, Technology, Engineering and Mathematics (STEM) Programs. PLTW is a non-profit organization delivering STEM programming to elementary, middle and high schools in all 50 states (https://www.pltw.org/about-pltw). Green architecture, if taken in combination with another PLTW class, Medical Detectives, can be counted as one-half of a high school elective credit. I teach this class at Clint Small Middle School in Austin,

Texas (http://www.smallmiddleschool.org/). Clint Small is an urban school with an enrollment of approximately 1000 students. Of that population, 43.4% is Hispanic, 42.9% is White, 4.6% is Asian and 3.9% being African American. The school has 33.7% and 5.7% of the students classified as economically disadvantaged and English Language Learners, respectively (http://ritter.tea.state.tx.us/). Green Architecture was offered for the first time last year at our school. Two sections were taught with a total of 58 students. 62% of the students were male and 32% were female. The gender make-up of the classes was remarkably different. One class had 13 males and 17 females whereas the other had 23 males and 5 females. All students in the school were allowed to choose Green Architecture as an elective.

Green Architecture starts the students out at the most basic level with learning how to use an architect's scale and learning how to read basic architectural markings and dimensions. The class culminates with the students designing a shipping container home; using four 8'x20' shipping containers to accommodate a family of four in case of a disaster. This is a great project but it does not lend itself to be extended to the point where an actual working model could be created by a middle school team because of the need for cut welding and metal work that would require the expertise of a professional. This is the reason I decided to create the final project of designing and

building a tiny house. This project has a student designing and building a tiny house that will fit on a 20'x8' trailer and be able to house 3-4 people on a semi-permanent basis.

Green Architecture provides a great foundation for teaching the basics of architecture. As I stated before, the course starts out with the basics of architecture but then it leads into actual designs on Autodesk® Revit®, a state of the art 3-D architectural software (http://www.autodesk.com/products/revit-family/features/all/gallery-view). Green architecture is made up of three separate units. The first unit concentrates solely on teaching the students how to use an architectural scale to accurately measure drawings and read architectural plans. They then learn about planning residential spaces, the different systems in a home, how to read the symbols found in architectural plans, and how to choose materials to remain within a given budget. The course continues by teaching the students sustainable architecture including how to build greener, hence the green architecture name. In the second unit students are challenged to research topics like the effects that daily living has on the environment, the steps of the recycling system, the ways to improve indoor air quality and other concepts related to building eco-friendly. All of these concepts are followed up by activities and problem based learning challenges. Lastly, the students draw a plan for a 3/4'-1' scale model of a wood framed shed and build the shed out of balsa wood. The culminating activity has the

students use the Autodesk® Revit® software to design a sustainable home using shipping containers to show what they have learned.

Although there are some advantages of this curriculum, it ends the same way as the rest of the courses I have been through before. This is the reason I decided to create a final project, having students design and build a tiny house that will fit on a 20'x8' trailer and be able to house 3-4 people on a semi-permanent basis. I intend for this project to be a means to allowing those students, who are motivated enough, to have a way to follow through by using real tools to build a real house that can be used by real families.

The students will start the new project by researching tiny houses; gathering as much information as possible about cost of materials, size requirements and other important details. After finding costs, the students will research ways to finance the project through either grants, crowd-funding or other forms of fund-raising. As of this report, I am in the process of trying to procure a Toyota grant to fund the initial tiny house. This will allow us to build and donate the first house while applying for funding for the next house; basically paying for the next house as we are building this year's model.

The students will then begin the process of designing their tiny house. They will begin with a design brief that outlines the criteria and constraints and follows through the entire design process, culminating in a presentation to the charity describing the

highlights of their house. The “winning” house will be chosen by a combination of the charity and members of the faculty at our school. I will explain the details of this in later sections of this report.

Another aspect of this project is to teach philanthropy through an engineering class. As I have mentioned before, the final piece of the project is to give the tiny house to a charity that would be able to use it to house a family in a time of crisis. The charities could range from a battered women’s shelter to a Red Cross-type organization that would need to put up a family on a short-term or up to semi-permanent basis. The students will have to do all of the research on charities and their needs. They will also have to contact those charities and make sure that the charity will be able to use the tiny house. Finally, they will be responsible for presenting the final project to the charity of choice. Allowing the students to perform all of these tasks will hopefully feel like they have an ownership stake in the tiny house project. If students are a part of every step of the process, the project becomes more meaningful and hopefully the students will create an end product they can be proud of to pass on to a worthwhile charity.

My interest in this project is multi-faceted. As I stated before, I was in several drafting architecture classes that left me feeling incomplete. I feel that students need to have a purpose and an attainable goal to make the project meaningful. Working on the tiny

house will hopefully provide the dangling carrot needed to motivate the students to do their best work.

Another thing that has me interested in tiny houses is the fact that in the United States we tend to live too large for our needs. According to census.gov, the average size of American houses over the last 40 years have grown approximately 1000 square feet. In 1973 the average house size was 1660 square feet and that number has risen to 2598 square feet in 2013 (https://www.census.gov/construction/chars/pdf/medavgsqft.pdf). We have too much stuff and the commercials we are inundated with tell us that we need even more, leading us to buying things we don't need while increasing our debt. The tiny house requires that you downsize ALL of your possessions, thereby reducing the amount of stuff you have and NEED to be comfortable. Building a tiny house on your own costs in between 20-40,000 dollars and you can buy a pre-built "large" tiny house for $40-60,000. People are selling their large houses and moving into a tiny house enabling them to pay off their debt and to live within their means; even being able to save for retirement.

Tiny houses also piqued my interest with their ability to reduce a person's carbon footprint. According to a "Vital Signs Online" report, fossil fuels accounted for 87 percent of the world's primary energy consumption last year (Cusick, 2013). With that

level of reliance on fossil fuels there is a need to develop alternative means of meeting those electricity needs. Tiny houses are a way to help solve some of the energy needs. First, the size of the house makes it easier to cool and heat. If the house is insulated well, the heat and air conditioning will run efficiently and use a lot less energy. Another thing that can be done on a tiny house to lower a person's need for fossil fuels is to connect it to a solar panel, wind turbine or both. The initial investment in the infrastructure for these alternative energies is high but it will pay for itself in a short amount of time; saving both fuel usage and money in the long run.

Water is also a concern for us here in Texas. Most of the state has been in a moderate to severe drought for the last few years with a small reprieve in the Spring of 2015. To deal with this issue, students in the class will have to integrate a water retention system for the tiny house. More than likely the tiny house will need an outside source of water, but the retention system will help to minimize the amount of water needed to sustain everyday life in the tiny house. One of the biggest users of water is the toilet. In a tiny house the normal toilet can be replaced with a self-composting toilet. There is very little water consumption with these types of toilets which drastically reduces the water consumption in the tiny house.

Lastly, it is not cheap to own your own house in Austin, Texas. Housing prices in the area have sky-rocketed over the last ten years and with an influx of approximately 110 people per day to the area, housing prices are climbing even higher. We have a need for affordable housing in urban areas in and around central Texas where the average price of a house being sold in Austin area is $333,866 (http://www.austinhomesearch.com/pages/austin-market-update). As I have stated before, a reasonably sized tiny house can be bought for $60,000 or less. If Austin follows other cities, like Portland, Oregon, we can create tiny house villages that have several tiny houses sharing a piece of land thus reducing the cost of the land per house and allowing families to own a house in a wonderful city.

Money should not be the reason why we do something but it is undeniable that money is a very important part of our lives. As society is progressing, saving money for things like retirement, college tuition or various other things that people want and need is becoming harder for a great deal of middle class Americans. Credit card debt and skyrocketing utility bills are genuine concerns, which need to be addressed.

Not only are there people with homes and a steady income having a hard time making ends meet, there is a section of our population that, although in decline, is a major

concern for the United States. In 2014, the number of homeless people in the United States was about 610,000 with over 215,000 of those people living without shelter.

Our carbon footprint is another reason for concern; the average carbon footprint of American households is astronomical by any standard, at 48 tonnes of carbon dioxide and in some suburban areas of greater Chicago, New York and San Francisco pushing towards 100 tonnes as cited in Mapping the American Carbon Footprint, Down to the Last Zip Code (Interactive Maps) (Jones & Kammen, 2014). Even our homeless have a carbon footprint of 8.5 tonnes which is twice the global average (Walsh & Sharples, 2008)

As of this writing, oil prices are at a 3-year low hovering around $50 a barrel and the average price of a gallon of regular gas costing about $2.39. But, at any time, on the whim of Saudi Arabia, a hurricane in the Gulf of Mexico or just general unrest in the world those prices could shoot through the roof. Also, according to the U.S. Energy Information Administration's (EIA) *International Energy Outlook 2014*, the global supply of crude oil, other liquid hydrocarbons, and biofuels is expected to be adequate to meet the world's demand for liquid fuels for at least the next 25 years. This number should make the average American shudder because that time frame puts the U.S. out of energy in a rather short period of time. Also, there is a pushback by the large oil and

coal companies to not fund the research into alternative energy sources. The U.S. and the world stand to be caught unprepared if some action is not taken NOW instead of waiting until the existing resources dry up. This combination of factors is more disturbing when you realize Americans are using fossil fuels at an alarming rate, producing carbon dioxide at a higher rate than any other country; all of this without considering its future costs.

Chapter 2 – Literature Review

TINY OR SMALL HOUSES

There is a moderately-sized movement happening in the United States, the tiny house movement. There is no single definition for what a tiny house is but the typical size of a small home secured to a foundation seldom exceeds 500 square feet and the typical tiny house on wheels is usually less than 8 ft. by 20 ft., with livable space totaling 120 square feet or less, for ease of towing and to exempt it from the need for a building permit. Tiny houses have a variety of uses ranging from philanthropic to just plain saving money. Tiny house housing projects like those found in Austin, Texas, Madison, Wisconsin, and St. Cloud, Minnesota, are some examples of how the tiny houses can be used to help provide temporary shelter and an address to the homeless who are trying to get back on their feet. Some people just want to downsize from the large homes they are living in across the United States and tiny houses are a way for them to do this thereby simplifying their lifestyles and saving money in the process. Finally, tiny houses provide their owners the opportunity to reduce their carbon footprint by eliminating waste, using alternative energy sources and creatively using rainwater for everything from drinking to watering a garden.

TINY HOMES HELPING THE HOMELESS

Tiny houses are not going to house the entire homeless population but they do provide a new beginning for some of these people trying to get back on their feet. In Austin, Texas, the Community First! Housing project is an example of a tiny house community being used to house the homeless. Alan Graham, president and CEO of Mobile Loaves and Fishes who sponsored the project summarizes why they are taking on such a task, “Those who work with the chronically homeless say it is critical to address basic needs such as housing before trying to solve problems such as mental illness, health problems and substance abuse” (Gaskill, 2014, para.7). Graham explains, for example, “that it is nearly impossible for those living on the streets to get jobs without an address or a place to clean up for an interview. The project aims to address the root causes of chronic homelessness” (Gaskill, 2014, para.7). Other cities in the United States are also opening up tiny house communities for the homeless. In regular shelters, the homeless are often times required to leave daily and return in the evening to secure a place to sleep. Tina Lamberts, a homeless advocate in St, Cloud, Minnesota explains, "What they really can't get is a place to call their own, and the privacy and dignity that comes with that” (Marohn, 2014, para.9). Carmen Guidi, a businessman in Ithaca, New York, who formed Second Wind Cottages, a community of six tiny houses for the homeless adds,

“Having a stable home has substantially improved the lives of the residents” (Marohn, 2014, para. 5).

These communities have created some much needed attention for helping solve the problem of homelessness. One example of this is a 16 year old young lady, Kendall Rozanno, who began building a tiny house after reading about the Community First! Village housing project in Austin, Texas. Initially she wanted to give it to a local charity in her hometown of Santa Cruz, California, “But, as soon as I found this organization, it really kind of appealed to me as I was watching Alan Graham’s videos, just his views and concepts, and he’s been working for the past 10 years on creating this plan,” Rozanno said. “One of the things that I’ve admired is they just have it together on that portion.” (York, 2015, para. 4) Tiny houses are not only for temporary housing. A lot of people are downsizing and moving into small or tiny houses. In her article, Margaret Aldrich states the focus of small or tiny house living is realizing "how much space (and stuff) we actually need, instead of how much we want or think we want."(Aldrich, 2011, para. 3). Aldrich ends her article by saying, "The idea is to live better and smarter and with your material goods pared down to only the things you need and those that are most precious to you, perhaps more soulfully too” (Aldrich, 2011, para. 9).

Tiny Homes as a Means to Create Comunity

Not only are people interested in reducing the size of their houses and minimizing their belongings, they are interested in a return to village-scale living. This is the idea that we need to get to know the people who live around us and ACTUALLY interact with those people. Tiny "pocket neighborhoods" are popping up in several places around the United States. These neighborhoods are built where the houses face a common area fostering cooperation with the neighbors and allowing for shared amenities. The design also helps build personal security due to the interaction created by the design of the area. The author of the article Tiny Houses, Tiny Neighborhoods, suggests that these neighborhoods are a great way to "provide a well-defined personal space while fostering a strong sense of community" (Priesnitz, 2014, p.16).

Tiny Homes as a way to Control Our Carbon Footprint

The tiny house movement is not just good for the soul; it is proving to be a more affordable option in places like Washington, D.C., where the median price per square foot is $450. The smaller houses lead to lower or no mortgages and lower monthly bills. The average size of new houses in the United States has increased over the last 30 years from approximately 1700 square feet to almost 2500 square feet. Lighting, heating and air-conditioning homes that large lead to extremely high utility bills along with the hefty prices being paid for the property and its maintenance and up-keep.

“Central air systems have become standard, contributing not only to larger fuel and electricity bills but also to a 25 percent spike in residential carbon dioxide emissions between 1990 and 2006” (Phillips, 2008, para. 1). A person’s carbon footprint is another reason that one might consider the tiny house lifestyle. A carbon footprint is defined by Merriam-Webster as “the amount of greenhouse gases and specifically carbon dioxide emitted by something (as a person's activities or a product's manufacture and transport) during a given period.” Most scientists believe that carbon dioxide emissions that have been directly correlated to global warming are leading to some potentially catastrophic results (IPCC, 2014).

One way of educating students and hopefully their parents is a web site called carbonrally.com. This is one of several websites where schools are pitted against each other across the United States to see which school could be the greenest. "Global warming is an abstract idea that is hard for people to connect to," says Bob Schildgen, the Sierra Club's environmental-advice columnist. "It's good to start at the basic level, with real numbers" (Walsh & Sharples, 2008, para. 5). Walsh and Sharples, the authors of “Sizing up Carbon Footprints” believe that learning your carbon footprint is the first step and that the websites like carbonrally.com are great starts because more people are likely to get involved if there is some sort of competition. Hopefully, the

objective of the website is to “turn the students (and their parents) from passive victims into climate warriors” (Walsh & Sharples, 2008, para. 7).

A carbon footprint is not the only lasting mark we can put onto the Earth. The materials used to construct a house or any other structure and its design are almost equally important as the amount of energy used to operate that structure. Santa Fe, New Mexico, architectural firm owner Ed Mazria calls on “architects and builders to consider the implications of the practices they use now, and to change them to protect the environment by reversing global warming trends.” (Hainsfurther, 2007, p. 18). Mazria and a sustainable design consulting firm are creating several sustainably built buildings around the area and believe in what they are doing. "Sustainability means not extracting more from the earth than can be replenished by it, so you're not sacrificing the well-being of future generations by the way we build today." (Hainsfurther, 2007, p. 18). They not only believe that design is important, but the materials that are being used are equally as important. Design is another integral aspect of sustainable architecture. Architects need to be aware of where the structure will be sitting and how it will be utilized as to be able to take advantage of anything nature offers to help offset energy usage. In the end, both the design and utilization of materials must be considered and used hand in hand or else it defeats the purpose of building the structure in the first place.

Water collection and conservation is another way someone could cut their utility bills in a tiny home. A fair number of the plans for tiny homes on wheels call for a water collection system as well as a composting toilet. If filtered correctly, rainwater can be used for everything from washing clothes to potable drinking water. Other options are primarily catching water from the roof and using it in other places around the yard and garden areas. One such example is to utilize the approximately 900 gallons of rainwater that comes off the roof during an episode that produces an inch of rain by diverting it with hoses to "fill" up the lawn or garden because our soil is never completely saturated during these types of rain episodes. Using the extra rain water allows you to rarely have to water and still maintain a nice green-space around your home.

SETBACKS

The tiny house movement has taken off in several areas around the United States but unfortunately it has not been an easy road thus far. In many cities there are outdated codes on lot sizes, room sizes and other aspects of tiny living that prohibit them from being permanent residences for people. An example of this is in Washington, D.C., where Jay Austin and a few other citizens bought and cleaned up a lot with the intention to create a tiny house village. After being ticketed for breaking the city codes on size and lot usage Mr. Austin still has optimism that he is helping bring about change in his city. He says that by using his house as a showpiece he can, "hopefully bring more public

support for an exciting new approach to easing the city's shortage of affordable housing" (Krainin, 2014, p.61).

SERVICE LEARNING

The tiny house has led me to introduce two new units of study into my Green Architecture class. The first unit has the students doing service learning where they, in small groups, carry out a service project based on the needs of a local charity. There are some pitfalls which must be overcome to have a successful service learning experience for the students as well as the partners who host the students. When a class has a service learning component, there must be a connection between what is in the curriculum and the service part of the learning. Too often, teachers and schools determine that the students need a service learning experience which is then added to the existing curriculum. After the introduction to service learning, there is a trip to a charity which needs help. During this trip, the students will learn the function of the charity and ways they can contribute. Students are then expected to complete their volunteer hours independently to earn full credit. Reminders of deadlines to submit their signed volunteer sheets will be given to students but additional time in class will not. An example of this comes from Edward G. Rozycki, the headmaster of a private preparatory school in Philadelphia during the late 1980's. The school board, community, parents, teachers and sponsors all decided that the upper-classmen needed to have a

service-learning component added to their graduation requirements. The school days were Monday through Thursday with Friday being the day Rozycki says, “the students were out for the “service learning” at the hospital, schools, department schools, factories, private businesses, whatever, and thereby -it was theorized-experience an aspect of the real-world relevance in what otherwise have been just a humdrum academic grind”(Rozycki, 1999, p.166). In the beginning, there was a lot of enthusiasm; by Thanksgiving, the sponsors started noticing tardiness, discipline problems, and a general state of lackadaisicalness by the students. Eventually, students began “cutting back to school” due to disinterest and loneliness experienced during their volunteer time. Rozycki conceded, “But, because “Academic Excellence” and “Real World Experience” were slogans of the academy, we slogged on, pretending-as do practitioners in every sphere of education-that hyperbole could make up for incompatible realities” (Rozycki, 1999, p.166).

A study done at the University of California, Los Angeles explored the comparative effects of learning and community service on cognitive and affective development of college undergraduates and to enhance their understanding of how learning is enhanced by service. The report shows that “the most important factor associated with a positive service learning experience appears to be the student’s degree of interest in the subject matter.” (Astin, Vogelgesang, Ikeda, & Yee, 2000, para. 9) They also

surmised that the service experience must enhance the academic material and the service is viewed as a learning experience. In the example by Rozycki, the school decided that there was a need for a service experience but it does not seem that there was any tie to the curriculum being taught at the school thus the dwindling interest in the service learning as the school year progressed. Another finding made by UCLA study suggests, "Providing students with an opportunity to process the experience with each other is a powerful component of both community and service learning (Astin, Vogelgesang, Ikeda, & Yee, 2000, para.14). In the Rozycki article the service learning experiences seemed to be done in a manner where the students volunteered to meet a set amount of hours without any type of follow through or debriefing leading to students who would rather be at school.

There are a number of studies that have been done on service learning and they all point to the same findings; there must be an interest in the learning by the students, the service learning must somehow pertain to the academic learning happening in the classroom, and the students must have a chance to talk about their experiences. If the experiences are contrived, students tend not to invest the time or effort other than to get the hours. To get more buy-in, include the students in the decision-making process and make the experiences authentic and tied to the curriculum.

SUSTAINABILITY EDUCATION

The second unit not only has students design and build a tiny house, it also has them research ways to live off the grid and repurpose materials to cut their carbon footprint. This unit introduces the idea of sustainability education. This type of education has been greatly debated over the years has had a hard time making it into the curriculum in many places. Early environmental education was presented as a collection of problems with the environment and challenges to prevent and solve those problems. Interestingly, this type of learning did not always include human change as being part of the solution. The shift towards involving humans in the equation has led to a more reasonable definition, "Sustainability development literacy derives from environmental and ecological theories with the addition of an emphasis on the interrelationship between human and natural systems" (Gough,2002, p.8). What had been taught as individual thematic units where certain aspects of the environment or ecosystem were studied are now being taught taking into consideration how humans are influencing the ecosystem and how they can help initiate a change by changing their own habits and destructive tendencies.

One of the biggest barriers to new literacies arises as "school curricula are organized into subjects defined by existing literacies, and prioritized by policy-makers on the basis of needs identified in relation to existing institutional structures, both organizational

and cultural" (Dale & Newman, 2005, p. 356). High stakes testing tends to be a giant road-block for sustainability education. Test scores are scrutinized from the school level all the way to the federal level. If a school, district or state is not producing at a high enough level, there is the potential for lost jobs or money. To be taught well, sustainability education needs to be taught across all disciplines not just as stand-alone units in science or some other discipline. Interdisciplinary learning does not always come easy for people rooted in their subject, those who laminate their lesson plans and don't stray from them year after year. Far too often, teachers start out with the best of intentions to teach in an interdisciplinary manner but, "There is a tendency for practitioners to retreat back to a single discipline, thus failing to capture the holistic nature of problems and their solutions "(Dale & Newman, 2005, p. 358).

Another challenge to teaching sustainability education comes from the political arena. There are policy-makers who are setting the curricula for what is to be taught in public schools who make decisions based on personal preferences and beliefs. "The traditional distinction between "hard", objective scientific facts and "soft" subjective value judgments is often blurred by political objectives" (Dale & Newman, 2005, p.359).

Although challenging, the idea of bringing sustainability education, in terms of living and building, into the classroom can be realized. Sustainability education has been taught at our school, Clint Small Middle School, for the last 15 years; starting in a single classroom

leading to the development of the Green Tech Academy three years ago. Luckily, our school administration sees the value in sustainability education and has supported me and my colleagues in the effort to integrate “green” education in our classrooms. It takes the effort of several teachers and a willing administration to make sustainability education work.

CONCLUSION

While tiny houses are not going to solve the problem of homelessness or fix the common person’s money crises, they are options that need to be considered. If people can convince cities and towns to ease restrictions on room sizes, lot sizes and other red tape issues, small houses are viable alternatives to the “McMansions” (https://en.wikipedia.org/wiki/McMansion) that have been built over the last thirty years. Tiny houses give the homeless an address and dignity. They have something and some place to call their own while getting back on their feet. Not only can tiny or small houses help the homeless, they are a way for a person or family to pare down their belongings and get rid of things that they don’t need. This reduces their consumption while reducing their debt. With the cost of houses going back up again, tiny living allows a person to sell their house and eliminate or drastically reduce mortgage payment. Lastly, when built correctly, with design taken into consideration, tiny houses help you

reduce your carbon footprint. Since they are so much smaller, tiny houses are more efficient to heat and cool and most are designed to utilize the natural flow of air to further lower cost.

Living in a tiny space may not be for everybody and care must be taken to become acclimated to living in such close quarters. But, if the idea is to save money, provide a comfortable shelter for yourself or others or just make you feel better about your impact on the Earth, tiny living may just be part of the answer.

Chapter 3 – Units of Study

HOMELESSNESS UNIT PLAN

Understandings

1. The homeless are a heterogeneous group of people struggling to meet the most basic human needs
2. Homelessness is widespread and my community and society.
3. The definitions of “home” and “homelessness” are complex and socially constructed
4. The media plays a significant role in forming public opinion about the homeless, the causes of homelessness and social assistance programs
5. It is important to treat the homeless as we would like to be treated
6. The use and distribution of natural, human and capital resources affects the quality of life and the environment
7. Teens can effect positive change in the community
8. Help is available for those suffering from abuse/trauma, addiction and mental illness

Knowledge and Skills

It is expected that students will:

- state a definition and describe homelessness in the U.S.
- give examples of needs met by government, business, civil society, and family.
- read and respond to an essay about homelessness by Anna Quindlen.
- reflect on how our use of language can show respect for people.
- write about personal routines.
- brainstorm basic resources not available to people who are homeless.
- take action through communication of issues, helping with a project, and/or by raising money/collecting items.

Essential Questions

1. What is a home? Who are the homeless people?
2. What is the incidence, rate and/or demographics of homelessness?
3. How does homelessness affect people in my community? In my school district?
4. What are the structural forces related to homelessness? (e.g., Legislation, public policy, living wage, affordable housing, unemployment, availability of programs to help people meet challenges ,mental illness, alcoholism, drug addiction, job training, education, physical illness/disability)
5. What are the hardships suffered by the homeless? (e.g. Disaffiliation from society, physical hardships due to lack of shelter, medical care, difficult to go to school regularly or to do homework-academic capital formation prevented)
6. How would I feel if I were homeless; how would I want people to treat me? Where do I get help when I've suffered trauma/abuse? If I have a substance abuse issue? If I'm homeless? How can I avoid becoming a homeless adult?
7. How do you find your gift?
8. How can I get involved in helping to end homelessness? How can I help homeless people?

Day 1-3
(2-3 45-Minute Sessions)

- Introduce lesson by giving the students statistics on homelessness.
- Discuss and address any questions that may be created in the course of the discussion.
- Give students materials and let them know they need to build a shelter for their group that will keep them protected from the wind and rain.
- Groups discuss what supplies a homeless person might find in their community if they needed to build a shelter outside.
- Bring group back together and have each group demonstrate their shelter and discuss their thoughts on how homeless people in their community would survive.

- Have students write a definition for homelessness and a description of what homelessness looks like.
- Work together to form a definition for homelessness.
- Discuss how government, businesses, families, and address the issue of homelessness.

Notes:

- The HUD definition of homeless "is the condition and social category of people without a regular house or dwelling because they cannot afford, do not desire, or are otherwise unable to maintain regular, safe, and adequate housing, or lack fixed, regular, and adequate nighttime residence."
- Be sensitive to the personal experience of the students. Some may be currently homeless. The lesson may generate discussion that may make them feel uncomfortable, or it may provide the empathy to allow them to discuss the issue in a safe environment.
- A day in advance, you may ask students to bring in some of the items to use for building structures. Make it clear that they should be recycled items, not items purchased for this.
- For an experience that is more meaningful you can plan an evening (until 11 or 12 pm) or an overnight outing using the same building materials. Of course this type of experience would take a lot of preparation such as finding a safe place for the outing and enlisting the help of other adults.

Day 4
(One 45-Minute Session)

- Write homeless on the board and discuss what part of speech it is and have them support their choice.
- Listen and compare. Introduce the "Homeless" essay by Anna Quindlen. (Appendix A)
- Read the essay in small groups.
- Have students reflect on the essay by completing the conclusion questions in their engineering notebook.
- Discuss as a class.

This is an opportunity for discussion so students can process the issue and have some awareness and sensitivity. They may consider how they would want to be treated if they were homeless.
Prepare copies of Anna Quindlen's "Homeless" article.

Activity 3- Challenges People Face:
(One 45-Minute Session, Plus time to plan and carry out a service project)

- Have students write a bulleted list of their daily routine including all preparations for the day; toilet habits, shower, food-prep and supplies.
- Ask what challenges homeless people have other than not having a home and have students brainstorm a list
- Have students find out how they could find out what basic needs local children and adults who are homeless may need
- As a group, select a service project based on needs, interests and talents.
- Make a plan and carry it out.
- Reflect in engineering notebook using conclusion questions.

When making the list of routines be sensitive to students who may not have the privilege of the supplies for a satisfactory routine. This may be a personal reflection, not shared aloud, but simply to raise awareness of the types of things we may take for granted in our routines.

Some basic difficulties to help students with a list:

1. Personal security, quiet, and privacy, especially for sleeping
2. Safekeeping of bedding, clothing and possessions, which may have to be carried at all times
3. Hygiene and shaving facilities
4. Cleaning and drying clothes
5. Obtaining, preparing and storing food in small quantities

6. Keeping contacts, without a permanent location or mailing address

7. Hostility and legal powers against urban vagrancy.

8. Reduced access to health care and dental services.

9. Limited access to education.

10. Increased risk of suffering from violence and abuse.

11. General rejection or discrimination from other people.

12. Loss of usual relationships with the mainstream

13. Not being seen as suitable for employment.

14. Reduced access to banking services

15. Reduced access to communications technology

WHERE THE HOMELESS LIVE - ACTIVITY

Introduction

Students will create a definition for homeless and homelessness. In an attempt to gain a sense of empathy for the situation of people who are homeless the students will also build a shelter from materials that the homeless might use while living on the street.

Equipment

- large shelter-building supplies, such as big boxes, blankets, and pieces of plastic/tarp
- Optional: Internet access for research

Procedure

1. Respond to the following in your journal by writing the first thoughts that come to your mind:

Fact: "Each year 3.5 million Americans experience homelessness." Children are overrepresented and make up 35% of people who are homeless but only 24% of the population as a whole. Two of the main reasons for homelessness are home foreclosures and poverty.

2. Homework: Bring in some supplies for making simple shelters, such as big boxes, blankets, and pieces of plastic.
3. You will work in pairs to create a shelter that will cover you and your partner. The shelter should be constructed to protect you from wind and rain.
4. You will have 30 minutes to construct your shelters.
5. Demonstrate your shelter and share your thoughts about how homeless people in their community would survive.

Class discussion: (answer in your journal)

6. What are some supplies a homeless person might find in their community if they needed to build a shelter outside?
7. Where they believe homeless people live?
8. What does homelessness look like?
9. Work with your partner to form a definition of *homelessness*.
10. How does the government, businesses, families, and nonprofits address the issue of homelessness

HOMELESS - ACTIVITY

Introduction

The class will discuss how we use the word homeless to mean different things when it is used as different parts of speech. The students will also read an article by Anna Quindlen and discuss how we can use language in a more respectful manner when addressing the issue of homelessness.

Equipment

Learner copies of Anna Quindlen's "Homeless" article (Appendix A)

Procedure

1. In your journal, respond to the following:
   What part of speech is the word, homeless? Explain why you believe that to be true.
2. Read the “Homeless” essay as a table. Read a paragraph and rotate the reading around the table.
3. Reflect on the essay by answering the conclusion questions. Be prepared to defend your answer.

Conclusion

1. Why might using the word *homeless* as a noun be insensitive or keep us from action?
2. How do you think people become homeless?
3. How do you think we should we react when we see a homeless person? (Ignore? Judge? Be friendly?) Why?
4. What might be some appropriate acts? (Give money? Share food? Donate money or **resources** to a shelter?)
5. In what way can we show respect for people who are vulnerable?
6. What **responsibility** do we have for other people?
7. What other groups have we turned into nouns or issues rather than people?

HOW CAN YOU HELP? - PROBLEM

Introduction

Students reflect on basic needs that may be difficult to meet when one doesn't have a home. They take action by creating personal hygiene kits or asking a local nonprofit how they can help support their efforts to assist homeless people.

Equipment

- Optional: Internet access for research
- Collected/donated supplies for service project

Procedure

1. Write a paragraph or bulleted list describing their morning or evening routine, including the use of clothing, make-up, cleansing products, electric appliances, food-preparation supplies, and rooms in their home.

2. What challenges do you think homeless people might face besides not having a place to live?

3. Brainstorm a list of basic difficulties/challenges for people who are homeless.

4. Investigate how you could help people who are homeless and in need of assistance. Make a list of items that are needed by local charities. Rank them in order of importance.

5. As a group, select a service project based on needs, interests, and talents. Make a plan and carry it out.

Conclusion

1. How can you communicate with others about the issue of homelessness to make a difference?
2. How might you get others to care about and act on this issue?

TINY HOUSE UNIT PLAN

Understandings:

It is possible to live comfortably in a smaller space with less stuff.

Tiny houses are inexpensive to buy and maintain.

Tiny houses require less energy and have a smaller carbon footprints.

Tiny house "villages" can create a greater sense of community in some areas.

Knowledge and Skills

The learner will:

- Demonstrate knowledge of measurement, construction, and design.
- Identify the parts of a wall section.
- Measure accurately using a tape measure and architectural scale.
- Read and interpret a blueprint of a floor plan.
- Understand the differences in new versus repurposed materials and when each are most cost effective.
- Create a plan to live off the grid
- Evaluate the costs of living off the grid.
- Demonstrate use of the Design Process including a Design Brief and Sketching,
- Use Autodesk Revit Architecture to create an architectural drawing.
- Design an environmentally friendly tiny home

Essential Questions:

How can a tiny house change the life of the occupant(s)?

How would living in a tiny house change the habits of "normal-sized" house living?

How do tiny houses serve to reduce our carbon footprints?

How could a tiny house be used to help with the homeless issue in Austin and in the United States?

Days 1-4 (4 - 45-Minute Sessions)

- The teacher will introduce the concepts of living off the grid and carbon footprint. Define and discuss.
- Students will complete the Living off the Grid Activity
- Sample utility bills can be found by doing a search for “sample utility bill” in the search engine of your choice

Days 5-7 (3 - 45-Minute Sessions)

- The teacher will introduce repurposed materials by using the New vs Repurposed Materials Activity
- Students will use their object and repurpose it for solving a simple common problem.
- Students will present describe their repurposed object.

Days 8 – 11 (4 - 45-Minute Sessions)

- Students complete New vs Repurposed Materials - Project

Days 12-21 (10 - 45-Minute Sessions)

- The teacher will review the Design Process using the following PowerPoints from Introduction Lesson 1.2 Design Process:
    - Design Process.ppt
    - Design Elements.ppt:
- The teacher will distribute and introduce Tiny House Problem.
- The teacher will show the tiny house presentation.
- The teacher will introduce an adult from the community who has experience with green architecture or sustainable home design who will be the client for this problem. Students will complete the Design Brief while the client explains their need for a tiny house design.
- The teacher will explain how the project will be evaluated using Tiny House Problem Grading Rubric. (Figure 1)
- Students will complete Tiny House Problem using the design process steps and completing the Design Brief template.

- Students will use appropriate engineering notebook template for daily entries.

Days 22-23:

- Students will present their Tiny House Solution to the client, teacher, and classmates.

- The teacher will evaluate using the Tiny House Problem Grading Rubric (Figure 1). *I have added some sample floor plans for the PLTW Shipping Container Problem. They are meant to show student expectations for the Tiny House Project. (As of this writing there are no actual student samples for the Tiny House as I have not taught this unit yet.)*
- Figures 2-4 show 3 levels of sketches. Figure 2 would score a 4-5 because of neatness and proper labeling. The sketch in Figure 3 would score a 3-4 because of a lack of labeling and incomplete detail. Figure 4 would only score a 0-1 based on neatness and a lack of architectural fundamentals that should have been learned by this point in the curriculum.
- Figures 5-7 show three levels of 3-D computer models. Figure 5 is neatly done and would score a 4-5, figure 6 has most of the components but left missed the mark on spacing within the house. Figure 6 would score a 2-3 on the Tiny house Rubric. Figure 7 shows a 3-D model but the student did not meet the criteria for building a functional house. This model would score a 0-1 on the rubric.

- One tiny house will be selected by a committee including the teacher, an adult community member and other faculty members.

- Building of the Tiny House will take place on the weekends and possibly into the summer. There is no timetable set in stone as of this writing.

Challenges to implementing Tiny House project:

Money is a huge challenge. Start early, you may want to wait a year and secure enough funding before using this unit in your classroom.

Have trade professionals lined up to help manage their part of the project as well as instruct students on proper installation. Schedule these professionals early as to make sure they are able to create the time in their schedule.

Students should make a written commitment to participate in as much of the work needed to be done afterschool, on weekends as well as into the summer. Parent commitments are recommended as well.

Don't limit the students to the "cream of the crop" as you may lose out on students who could benefit from this type of learning.

It helps to have the support of the administration. Talk with them early and arm yourself with research that defends your project

LIVING OFF THE GRID - ACTIVITY

Introduction

Living off the grid refers to living in a manner in which the house being lived in does rely on one or more public utilities. A true off the grid home is considered to be autonomous; not reliant on municipal water supply, sewer, natural gas, electrical power grid or any similar utility services.

In this activity you will explore several ways to be able to build a home without using the city hookups for utilities (Electric, gas, water, wastewater, etc.).

Equipment

Internet for research
Sample utility bills
Engineering notebook
Excel or any other spreadsheet application

Procedure

1. Locate ways to live off the grid for the following "needs":
    - Electricity
    - Gas
    - Water
    - Wastewater
    - Other
2. Determine the startup cost for each using a 20'x8' "house" as your standard.
3. How long will it take for you to break even by utilizing these off the grid techniques? (You will need to figure out how much it will cost to live using the cities utilities.)

Conclusion

What would be required to take your house off the grid?

How long would it take to break even if you took your house off the grid?

What are some barriers to living off the grid?

NEW VS REPURPOSED MATERIALS - ACTIVITY

Introduction

Every day people across the world throw away tons and tons of useful objects that end up in the landfill. A vast number of these objects can be repurposed and used in a different manner around the house. There are crafters and "makers" who specialize in this type of recycling; either using it in its existing state or changing it to fit their need. In this activity you will take an object that normally would be thrown away and create a useful solution to a problem you have at home.

Equipment

2 liter bottle
Wine bottle or other glass bottle
Egg carton
Pizza Box
Pringles can
Yogurt Containers
Plastic cutlery
Paper towel rolls
Scissors
Hobby knife
Tape
Hot Glue

Procedure

1. Receive an object from the teacher.
2. Make a list of minor inconveniences you experience around your house. For example, there are too many cords for all my devices and it looks tacky.
3. Independently brainstorm at least five ideas for your object. Write a brief description and create a sketch for each and label. (5 minutes)
4. Each member has 2 minutes to describe their ideas to their group.
5. The group picks one design to build and one for a backup.
6. Using the materials and equipment you have been given to create the new object. (30-45 minutes)
7. Present your finished product to the class.

Conclusion

1. What are some reasons that people don't repurpose more of the trash they throw away?

2. Make a list of 10 or more objects that people throw away and briefly explain how you or someone else might repurpose those objects.

3. What are some benefits to repurposing objects? (Think local as well as global.)

NEW VS REPURPOSED MATERIALS - PROJECT

Introduction

In this project you will weigh the options between using repurposed material as opposed to new materials to build a shed for your back yard by creating a budget. You must determine the best plan of action because you will have limited money resources.

Equipment

Excel
Internet
Engineering Notebook

Procedure

1. Using the plans you created in the Building a Wall Activity determine the materials you will need to build the walls and roof for your shed.
2. Using Excel or any other spreadsheet to create a chart that will help you keep up with your materials and costs for both new and repurposed materials.
3. Use the internet to locate the materials, both new and repurposed. (You may need to make phone calls as many stores do not post prices on the internet.)
4. Using the Excel chart determine what materials you are going to use to build your shed. Justify your decision by using the data you have collected

Conclusion

What was the hardest part of this project? Why?

Describe instances where repurposed materials would not be appropriate for the building.

TINY HOUSE PROBLEM

Introduction

Safe, secure, affordable housing is needed in many parts of the country. There approximately 600,000 homeless people living on the streets here In the United States. 80% of the homeless have experienced some form of stressful life event in past year (death, job loss, home loss, health issue). Tiny houses are a way that organizations are attacking not just the home part of homelessness but the hardships associated with trying re-enter society as a productive citizen.

Tiny houses being used as semi-permanent housing for the homeless has become an emerging trend in several cities nationwide. Tiny house villages have popped up in Austin, TX, Madison, WN as well as other places. These tiny houses provide previously homeless people to have a permanent address and a place to shower, shave, etc. as they try to get a job and back on their feet.

In this problem you will design a one-story tiny home from new and reclaimed materials using your knowledge from this unit, consider factors like room sizes and relationships, kitchen working triangle, and plumbing configurations.

Equipment

- Engineering notebook
- Pencil
- ¼" Graph paper
- Tape
- Glue stick
- Architectural scale
- Architectural templates
- Computer with Autodesk Revit
- Design Brief, Decision Matrix, Design Process Solution Templates

Procedure

Your challenge is to design a tiny home from new or reclaimed building materials. The tiny house must fit on an 8'x20' flat trailer. It must be made into a living space for a family of 3-4. The house must have places for each of the people to sleep. (Not necessarily have a room to themselves.) The house must have a bathroom with a shower and toilet. Finally, it must have a place to cook meals.
The house can only be 13'-4" at its highest point including the 1'-7" height of the trailer and 8'-5"at its widest point.
Each student in the class will have 5 minutes to present their designs to the client and classmates. Presentations will occur on _____.

1. Complete the Design Brief as you listen to the client interested in purchasing your tiny house design.
2. Review the Tiny Grading Rubric so that you are familiar with the grading criteria.
3. You will create three potential solutions starting with an 8'x20' rectangle on graph paper (1/4" graph so ¼" = 1' scale).
4. Sketch in room walls, window and door openings. Label rooms and sizes.
5. Use the Decision Matrix to determine which of the three tiny house designs you will continue to use for this project.
6. Use the architectural templates to sketch doors, furniture, fixtures and appliances in your final design.
7. Use colored pencils to lightly and neatly color each of the following areas.
    a. Service area – green
    b. Sleeping area – blue
    c. Living area – red
8. Use the Autodesk Revit software to draw your tiny house. Include doors, windows, furniture, fixtures, and appliances.
9. Dimension the floor plan and print a copy with dimensions, room labels, furniture, and appliances.
10. Create and print a 3-D view without a roof.
11. Add a roof and print another 3-D view.
12. Present your design idea to the client and your classmates.

Conclusion

1. What was the most difficult part of designing a tiny home? Explain why.
2. Describe why you chose this design from your three options.
3. Describe five features you could include in this shipping container home to make it more “green”.
4. Would you consider living in a tiny house? Why or why not?
5. After listening to your classmates’ presentations, describe some innovative ideas they shared that are eco-friendly.

Tiny House Problem - Grading Rubric

Figure 1 - Tiny House Rubric

Elements	Weight	5 Points	4 Points	3 Points	2 Points	1-0 Points	Total
Design Brief		Design brief is completed and includes all required information, including client, designer, problem statement, design statement, constraints, and deliverables.	Design brief is 80% complete.	Design brief is 50% complete.	Design brief is less than 50% complete.	Design brief is less than 25% complete or missing.	
Research		Research is documented with appropriate citations. Research shows a variety of resources and is not limited to one or two sources.	Research is documented on some topics. One or two do not have proper citation information. Research is limited to two or three resources.	Research is randomly completed with little or no documentation of sources.	There is no research other than what is available from the textbook or lecture notes.	There is little or no evidence of research in the notebook.	
Design Sketches		Three sketches are complete and annotated to show all important information. All designs are unique and are completed in pencil.	One sketch is not complete and is missing important information, such as measurements. The designs are unique and are completed in pencil.	Two sketches are missing more than half of the identification of components.	All sketches are not complete. Sketches are not completely created with pencil.	There is no evidence of sketches in the notebook.	

Figure 1 (continued)

Required Criteria		90% or more of the required criteria are met: appropriate living, service, and sleeping space, closets, storage, doors, windows, furniture, and appliances. Green features are included.	75% or more of the required criteria are met: appropriate living, service, and sleeping space, closets, storage, doors, windows, furniture, and appliances. Some green features are included.	60% or more of the required criteria are met: appropriate living, service, and sleeping space, closets, storage, doors, windows, furniture, and appliances. Few green features are included.	40% or more of the required criteria are met: appropriate living, service, and sleeping space, closets, storage, doors, windows, furniture, and appliances. Green features are not included.	Less than 40% of the required criteria are met: appropriate living, service, and sleeping space, closets, storage, doors, windows, furniture, and appliances. Green features are not included.	
Required Drawings		Floor plan drawings, 3-D drawing with a roof, and 3-D drawing without a roof are > 90% complete.	Floor plan drawings, 3-D drawing with a roof, and 3-D drawing without a roof are > 75% complete.	Floor plan drawings, 3-D drawing with a roof, and 3-D drawing without a roof are > 60% complete.	Floor plan drawings, 3-D drawing with a roof, and 3-D drawing without a roof are > 40% complete.	Floor plan drawings, 3-D drawing with a roof, and 3-D drawing without a roof are < 40% complete.	
Communicate Solution		The presenter effectively and creatively delivers the information while staying on topic. The presenter appears relaxed and self-confident. Body language, voice modulation, and eye contact are effectively used.	The presenter adequately delivers the information while staying on topic. The presenter appears relaxed and self-confident. Body language, voice modulation, and eye contact are mostly appropriate.	The presenter delivers the information but does not stay on topic. The presenter appears tense or nervous. Body language, voice modulation, and eye contact are inappropriate or lacking.	The presenter omits important information and does not stay on topic. The presenter appears tense or nervous. Body language, voice modulation, and eye contact are inappropriate or lacking.	The presenter does not effectively deliver the necessary information.	

Figure 2 - Sketch scoring a 4 or 5 on Tiny House Rubric

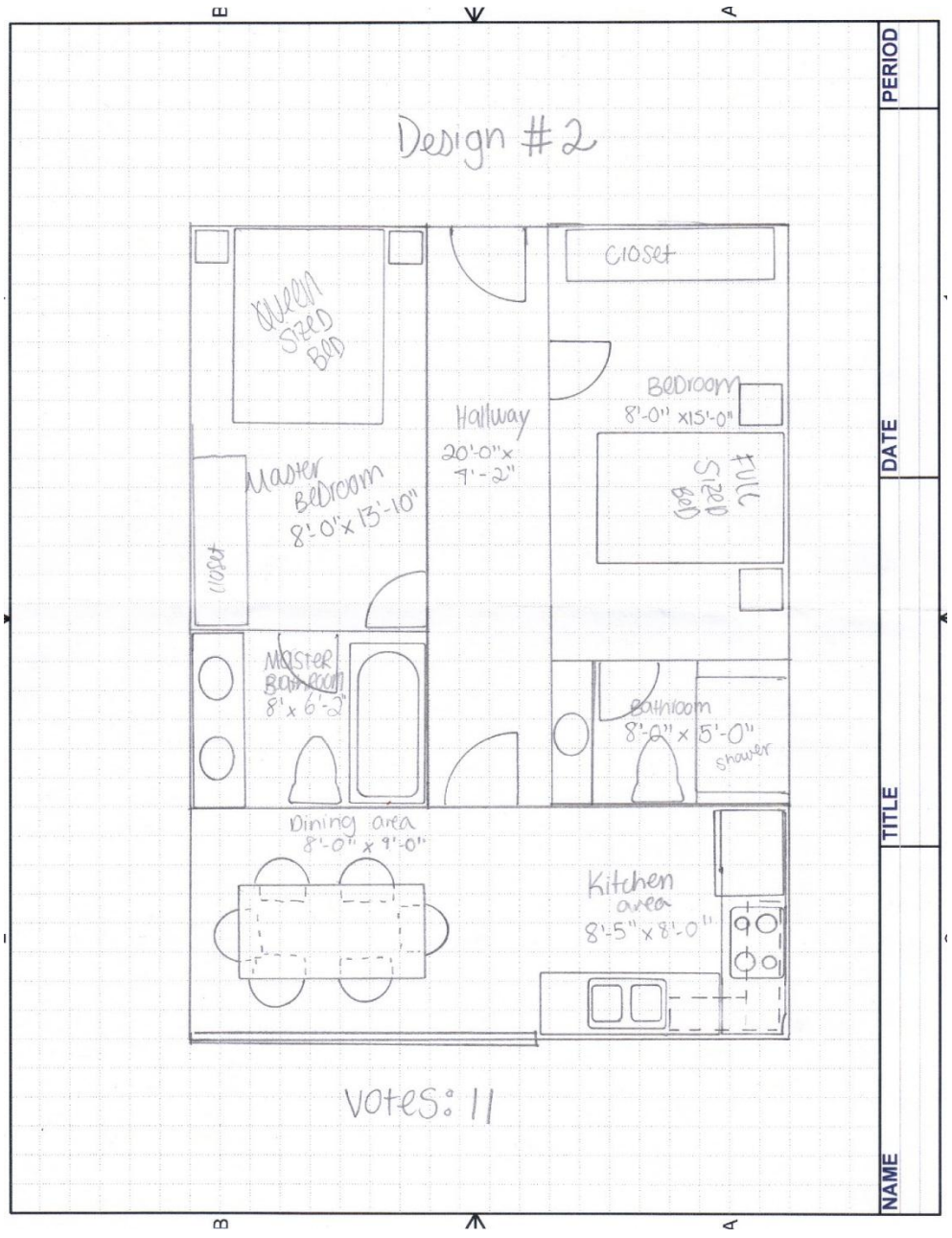

Figure 3 - Sketch scoring a 2-3 on the Tiny House Rubric

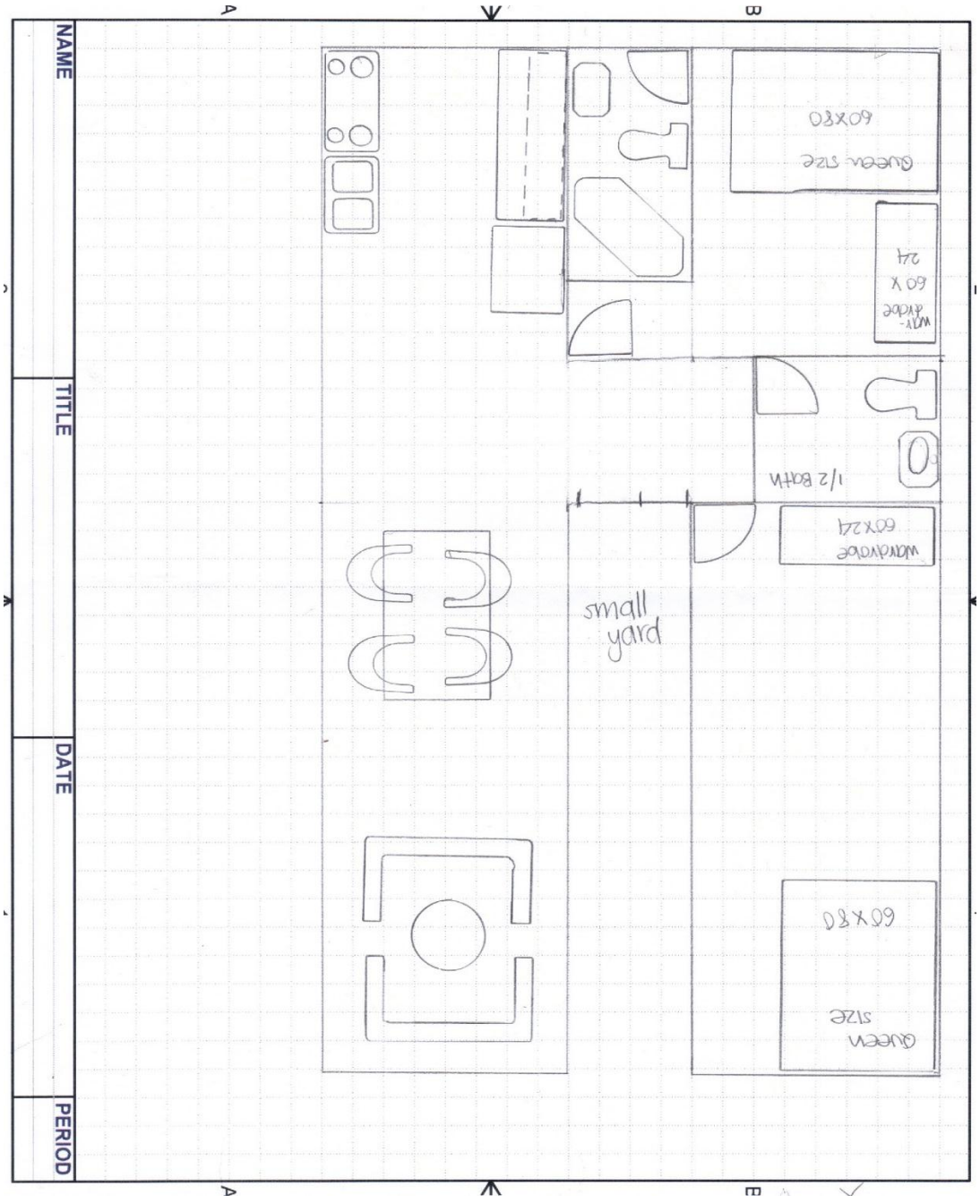

Figure 4 - Sketch scoring a 0-1 on Tiny House Rubric

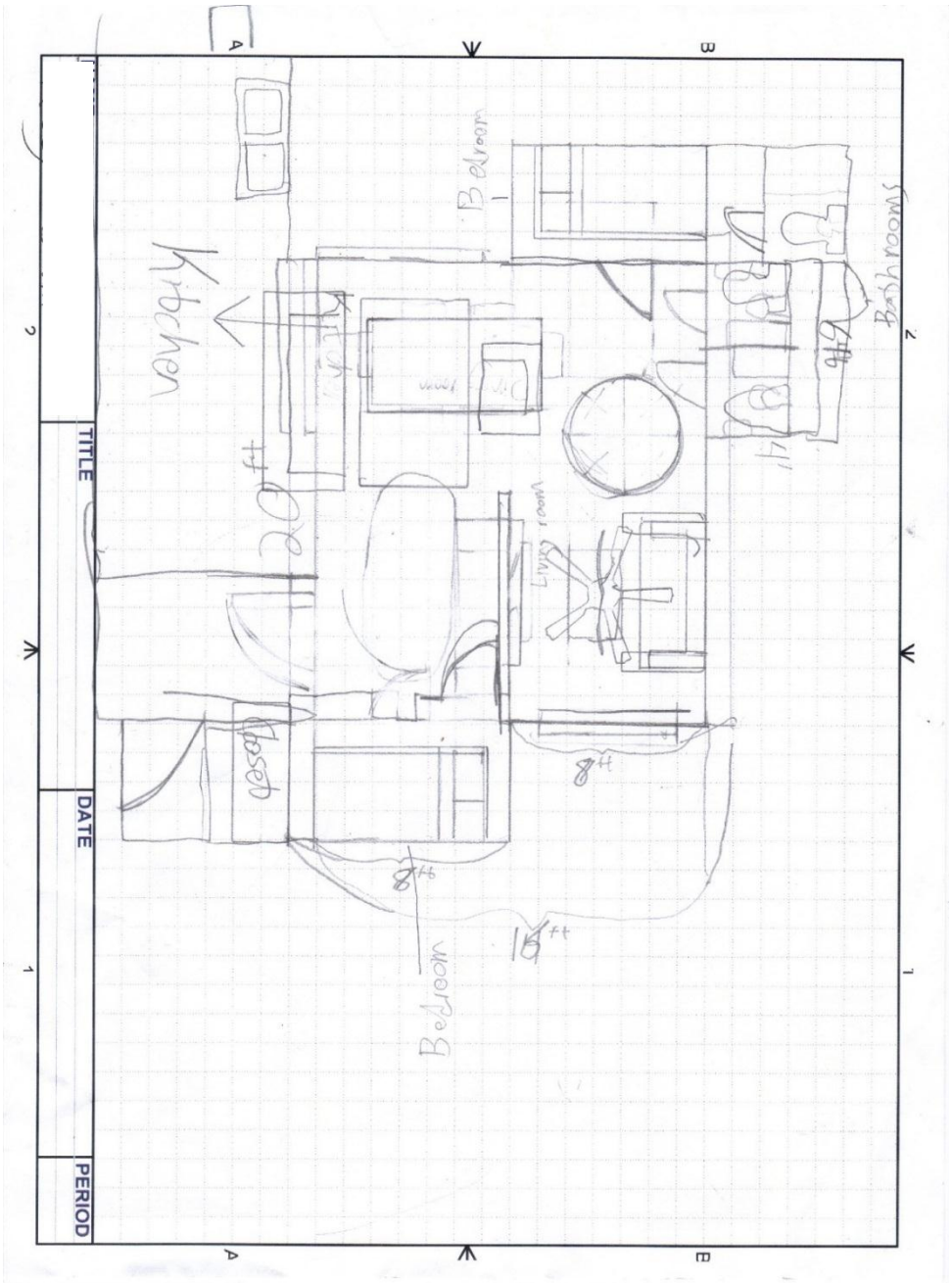

Figure 5 - 3D drawing scoring 4-5 on Tiny house Rubric

Figure 6 - 3D drawing scoring a 2-3 on Tiny House Rubric

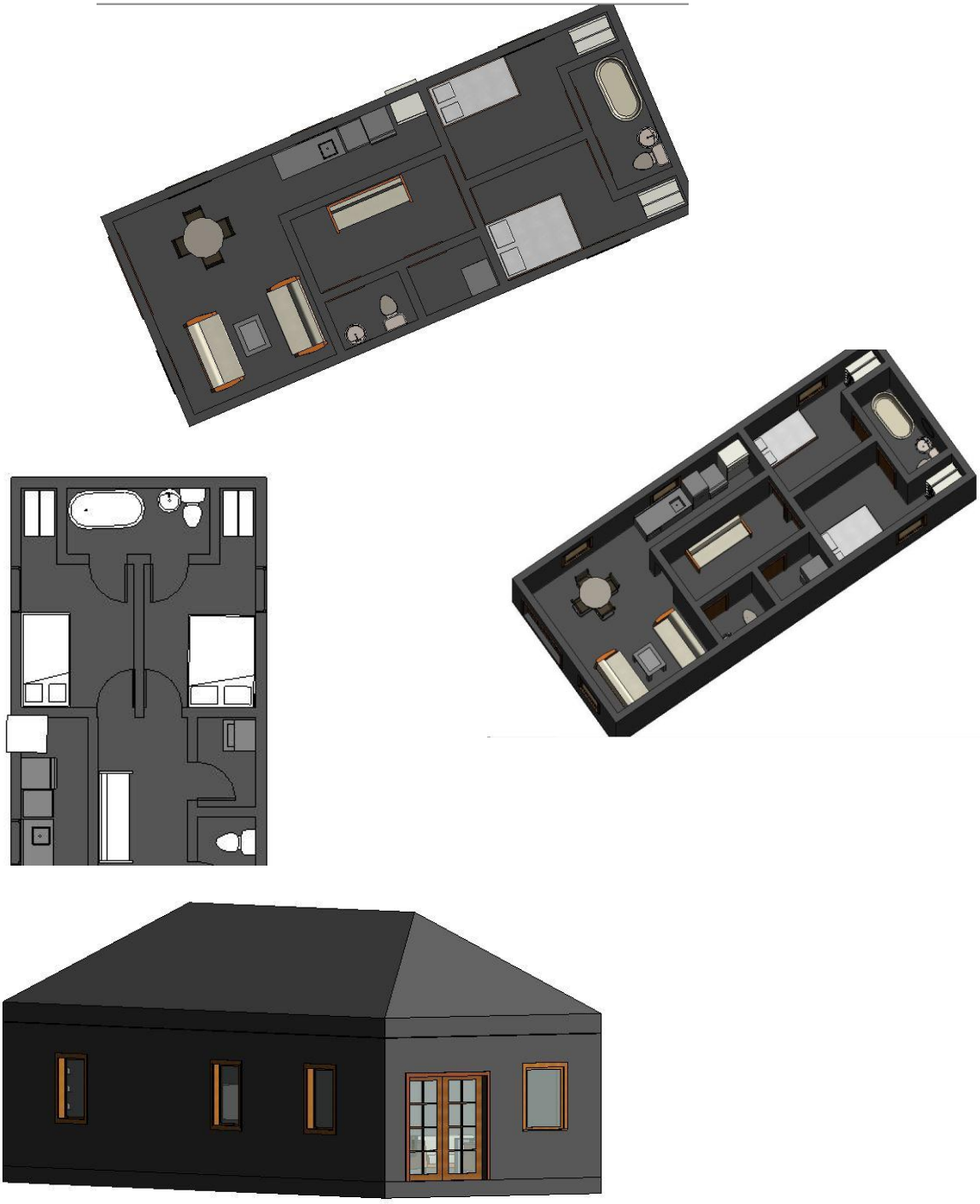

Figure 7 - 3D drawing scoring a 1-2 on Tiny House Rubric

Chapter 4 – Considerations for Practice

The units of study that I have created are meant to augment a class called Green Architecture in the Project Lead The Way Gateway to Technology curriculum. The first is a service learning unit on homelessness. The second is designed to be a capstone project. Students involved in this unit must be willing to put in extra time and effort. They will create a tiny house that will be donated to a local charity involved in helping the homeless. I feel there is a need for a class that allows a student to move past the traditional drafting and architecture classes offered in public school. I see students become disinterested because they see no worthwhile outcome to the class. I want this to be a class where I capture some of those students who may not have all of the "smarts" for the lessons but will persevere and learn because they want to have a chance to make something big to help their community.

The service learning unit will be integrated into the class curriculum over the course of the semester. I believe implementing it in this manner will help alleviate some of the problems that arise from having it as a stand-alone unit. Many students don't see the direct impact they have on others by volunteering their time or even why it is important. Allowing students the time to develop this understanding is extremely valuable for the success of the capstone project. Showing them how community service and teaching sustainable living to others will not only provide a strong foundation of

knowledge, but will also allow them to understand, firsthand, the value of helping others.

For me, I want my students to actually go out into a “homeless” situation and experience what it feels like to have to live just one night with the resources that a homeless person might have in their possession. The experience will take part on school property without access to any of the facilities and will be monitored by adult volunteers. During the capstone project, I will have the students re-visit that trip. This may help them better understand how the tiny house that we are going to build might be able to help a person or family on the path to a more stable future and forever home. Another challenge to implementing service learning is teachers who feel like there is not enough time to do both the service learning and the academic learning. This tends to lead towards a “do the service learning on your own time” attitude by the teacher. As I mentioned in the literature review, the service learning is lost if the teacher does not give the students time to talk with each other and reflect on what they have learned and how it relates to the academic learning they are doing in the class. I intend to set aside time during the week to work solely on service learning. This will allow individual students to meet with me or in small groups to discuss their progress and determine the next step in the process. I also intend for each student to keep a journal during the service learning unit allowing for reflection, setting timelines and

documenting other “important” things they have learned. Time should not be an issue; if teachers give a little each day it will allow this to be a valuable learning experience for the students.

The final project in the second unit, the Tiny House, is not intended for the entire class. The students who take this path will have to be committed to following through on the entire project because there will be time obligations on weekends and possibly into the summer. This is where the first challenge comes up; finding the students who have the interest and the time to commit to the project. It seems that the students who are interested are the ones who also have extra-curricular activities that extend into the weekend and summer. Another reason I added the Tiny House unit is because I felt the current Project Lead The Way unit, which is highly detailed and the students are well taught in architectural concepts, left out some important facets of green living. I intend to have all students participate in the New vs. Repurposed and the Living off the Grid activities and problems because they are going to benefit from the knowledge they gain while working on these activities.

The Tiny House itself poses a number of problems in and of itself. The first is the cost associated with a project of this magnitude. Our first Tiny House has a materials list with the cost in the range of $25,000 for all brand new equipment. As I stated in my introduction, we are working on a grant to build this tiny house as well as other

sustainable education projects. If the grant falls through, I will have to revert to other means of fund-raising in the form of crowd-funding, bake sales, etc. The second challenge that I will face is volunteers, not just parents but professionals who know the trades necessary to build a completed and safe structure. This is where you need a strong support team. The Small Middle School Green Tech Academy Director, Dr. Sherry Lepine, has done a great job in the past few years to build our program; this includes national recognition for the Eco-Schools USA Green Flag Award from the National Wildlife Federation (Fowler, "First School in Texas to Earn National Award for Sustainability Initiatives!")**.** She has worked with the community and has made vital contacts with people who will be integral in the completion of the tiny house project. The third and sometimes the hardest challenge is to get the community, administration and parents to support service learning and sustainable education. The powers that be tend to put these types of projects aside in favor of the academic curriculum necessary for passing high stakes testing. Be prepared to defend your project.

THOUGHT EXPERIMENT

Another consideration is, of course, evaluating the effectiveness of the unit. I would be inclined to start with a simple pre-interest inventory to gather information regarding the students' interest in sustainability and service education to determine a baseline for the class. I would also do some interviews with the students to clarify misunderstandings or

confusions that the students have regarding sustainability and service education. I feel the interviews will be necessary because the students come to class with varying levels of understanding of these types of concepts mainly due to previous exposure through school or other institutions. After the lessons and when they are choosing which path to follow, the tiny house problem and construction or the shipping container problem without the construction follow-through, I will give them a mid-project survey. With this survey I would hope gather information on how their perspectives have changed, their interest in further learning experiences and how they feel the class has impacted them either positively or negatively. At the conclusion of the project, whether it be the tiny house or the shipping container problem, I will give them the same survey as the mid-project survey and exit interviews with each of the students. By doing these things my goal is to find how being part of the completion of the entire project influences their interest in further learning in both sustainability and service education. During the entire process I plan on doing some informal interviews with individuals or groups to gauge how a lesson is progressing, their thoughts on the lesson or to find out what they really know but won't write on the surveys. As a teacher, I find that I can get a lot more information out of students if I sit down with them at their table or workstation and start a conversation regarding the work or just to check on them personally. I have been successful with all types of students using this type of interaction.

If I were to expand this project, I would try to follow the students through high school and, if I am persistent, into education beyond high school as well as I could to measure if they have maintained their service learning or participation in volunteer service at some level. At this point, there are very few programs in my area that provide sustainability education so I would ask if they have future sustainability education plans. I would also want to try and determine whether or not there were any lasting effects from the service learning they were introduced to during the lessons and projects done during the units I implemented in my classes. Since this is an eighth grade capstone project at a school with a fairly non-transient population, I feel it would be easy to keep track of them through their high school years and quite possibly a few into college or post-high school learning. This may prove to be a bit ambitious, but it is a possibility for this thought experiment.

Appendix A - Homeless By Anna Quindlen

Her name was Ann, and we met in the Port Authority Bus Terminal several Januarys ago. I was doing a story on homeless people. She said I was wasting my time talking to her; she was just passing through, although she'd been passing through for more than two weeks. To prove to me that this was true, she rummaged through a tote bag and a manila envelope and finally unfolded a sheet of typing paper and brought out her photographs.

They were not pictures of family, or friends, or even a dog or cat, its eyes brown-red in the flashbulb's light. They were pictures of a house. It was like a thousand houses in a hundred towns, not suburb, not city, but somewhere in between, with aluminum siding and a chain-link fence, a narrow driveway running up to a one-car garage, and a patch of backyard. The house was yellow. I looked on the back for a date or a name, but neither was there. There was no need for discussion. I knew what she was trying to tell me, for it was something I had often felt. She was not adrift, alone, anonymous, although her bags and her raincoat with the grime shadowing its creases had made me believe she was. She had a house, or at least once upon a time had had one. Inside were curtains, a couch, a stove, and potholders. You are where you live. She was somebody.

I've never been very good at looking at the big picture, taking the global view, and I've always been a person with an overactive sense of place, the legacy of an Irish grandfather. So it is natural that the thing that seems most wrong with the world to me right now is that there are so many people with no homes. I'm not simply talking about shelter from the elements, or three square meals a day, or a mailing address to which the welfare people can send the check--although I know that all these are important for survival. I'm talking about a home, about precisely those kinds of feelings that have wound up in cross-stitch and French knots on samplers[1] over the years.

Home is where the heart is. There's no place like it. I love my home with a ferocity totally out of proportion to its appearance or location. I love dumb things about it: the hot-water heater, the plastic rack you drain dishes in, the roof over my head, which occasionally leaks. And yet it is precisely those dumb things that make it what it is--a place of certainty, stability, predictability, privacy, for me and for my family. It is where I live. What more can you say about a place than that? That is everything.

Yet it is something that we have been edging away from gradually during my lifetime and the lifetimes of my parents and grandparents. There was a time when

where you lived often was where you worked and where you grew the food you ate and even where you were buried. When that era passed, where you lived at least was where your parents had lived and where you would live with your children when you became enfeebled. Then, suddenly, where you lived was where you lived for three years, until you could move on to something else and something else again.

And so we have come to something else again, to children who do not understand what it means to go to their rooms because they have never had a room, to men and women whose fantasy is a wall they can paint a color of their own choosing, to old people reduced to sitting on molded plastic chairs, their skin blue-white in the lights of a bus station, who pull pictures of houses out of their bags. Homes have stopped being homes. Now they are real estate.

People find it curious that those without homes would rather sleep sitting up on benches or huddled in doorways than go to shelters. Certainly some prefer to do so because they are emotionally ill, because they have been locked in before and they are determined not to be locked in again. Others are afraid of the violence and trouble they may find there. But some seem to want something that is not available in shelters, and they will not compromise, not for a cot, or oatmeal, or a shower with special soap that kills the bugs. "One room," a woman with a baby who was sleeping on her sister's floor once told me, "painted blue." That was the crux[2] of it; not the size or location, but pride of ownership. Painted blue.

This is a difficult problem, and some wise and compassionate people are working hard at it. But in the main I think we work around it, just as we walk around it when it is lying on the sidewalk or sitting in the bus terminal--the problem, that is. It has been customary to take people's pain and lessen our own participation in it by turning it into an issue, not a collection of human beings. We turn an adjective into a noun: the poor, not poor people; the homeless, not Ann or the man who lives in the box or the woman who sleeps on the subway grate.

Sometimes I think we would be better off if we forgot about the broad strokes and concentrated on the details. Here is a woman without a bureau. There is a man with no mirror, no wall to hang it on. They are not the homeless. They are people who have no homes. No drawer that holds the spoons. No window to look out upon the world. My God. That is everything.

References

Aldrich, M. (2011, May). Home sweet tiny home. *Utne,* , 73. Retrieved from http://ezproxy.lib.utexas.edu/login?url=http://search.proquest.com/docview/866668774?accountid=7118

Astin, A. W., Vogelgesang, L. J., Ikeda, E. K., & Yee, J. A. (2000). How Service Learning Affects Students. *Higher Education, (*2000). Retrieved from www.digitalcommons.unomaha.edu/slcehighered/144

Cusick, D. (2013, October 25). Fossil Fuel Use Continues to Rise. Retrieved August 10, 2015, from http://www.scientificamerican.com/article/fossil-fuel-use-continues-to-rise/

Dale, A., & Newman, L. (2005). Sustainable development, education and literacy. *International Journal of Sustainability in Higher Education, 6*(4). Retrieved from http://dx.doi.org/10.1108/14676370510623847

Fowler, M. (2015, April 15). First School in Texas to Earn National Award for Sustainability Initiatives! Retrieved August 9, 2015, from http://blog.nwf.org/2015/04/first-school-in-texas-to-earn-national-award-for-sustainability-initiatives/

Funtowicz, S., & Ravetz, J. R. (1999). Post-normal science: An insight now maturing. *Futures, 18*(7), 641-646.

Gaskill, M. (2014, August 28). Innovative new East Austin micro-village will rent to homeless for $210 a month. *Culturemap Austin*. Retrieved from http://austin.culturemap.com/news/innovation/08-28-14-community-for-the-homeless-becoming-reality/

Gough, S. (2002). Right answers or wrong problems? Towards a theory of change for environmental learning. *The Trumpeter, 18*(1), 1-15.

Hainsfurther, S. (2007). Sustainable architecture is here, now. *New Mexico Business Journal*, *31*(6), 18.

IPCC, 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp

Krainin, Todd. "Washington's Beautiful, Illegal Tiny Houses." *Reason* 12 2014: 60-1. *ProQuest.* Web. 8 Mar. 2015.

Long, C. (2012, September 1). A Better Rainwater-Harvesting System. *Mother Earth News, August/ September* (2012). Retrieved from http://www.motherearthnews.com/homesteading-and-livestock/self-reliance/rainwater-harvesting-zm0z12aszhun.aspx

Marohn, K. (2014, August 21). Tiny houses aim to help homeless. *USA Today*. Retrieved from http://www.usatoday.com/story/news/nation/2014/08/21/tiny-houses-aim-help-homeless/14411661/

Phillips, K. E. (2008, January 1). Super Size My House. *Audubonmagazine.org, Jan/Feb*(2002). Retrieved from http://archive.audubonmagazine.org/fieldnotes/fieldnotes0801-energy.html

Priesnitz, W. (2014). Tiny Houses, Tiny Neighborhoods. *Natural Life*, (156), 12-19.

Quindlen, A. (1988). Homeless. In Living out loud (pp. 201-204). New York: Random House.

Rozycki, E. G. (1999). Service? Learning? *Educational Horizons,* Summer (1999), 166-167.

Walsh, B., & Sharples, T. (2008, May 15). Sizing Up Carbon Footprints. *Time, 171*(21). Retrieved from http://content.time.com/time/magazine/article/0,9171,1806804,00.html

Wilson, L. (n.d). Mapping the American carbon footprint, down to the last zip code (interactive maps. *Shrink That Footprint.* Retrieved from http:// http://shrinkthatfootprint.com/american-carbon-footprint

York, J. A. (2015, February 16). Santa Cruz woman builds tiny house, donates to homeless. *Santa Cruz Sentinel*. Retrieved from

http://www.santacruzsentinel.com/social-affairs/20150216/santa-cruz-woman-builds-tiny-house-donates-to-homeless